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THE JOURNAL OF THE BRITISH VETERINARY ASSOCIATION

The Veterinary Record

PATRON: HER MAJESTY THE QUEEN

Vol. 71 No. 9 Issue No. 4221 163-180

February 28th, 1959

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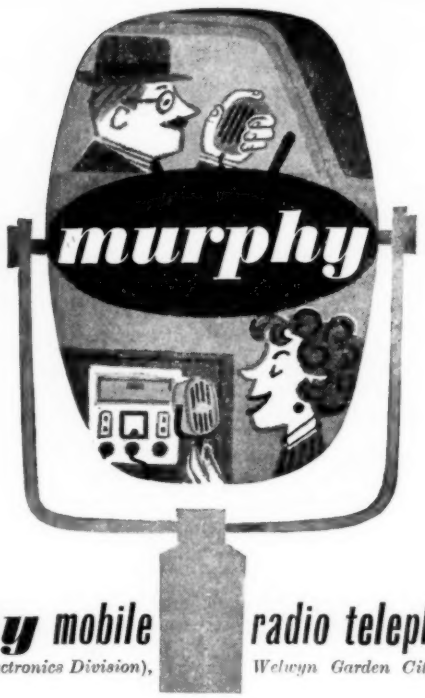

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No. 9 FEBRUARY 28th, 1959 Vol. 71

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Bephenium Embonate in the Prevention of Nematodirus Infestation in Lambs

BY

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SUMMARY.—An effective dosing routine for the prevention of Nematodirus infestation in lambs using the anthelmintic bephenium embonate has been examined.

Details are given of the methods used and the results obtained.

The relationship between the likely periods of exposure to infective larvae and the dosing routine is discussed.

Introduction

IN a previous publication (Rawes & Scarnell, 1958) a method of preventing nematodiriasis using the new anthelmintic bephenium embonate was suggested. A consideration of the epidemiology of the disease caused by *Nematodirus battus* and *N. filicollis* led to the view that the drug should be administered at approximately 3-weekly intervals, at the beginning and end of May and again in mid-June.

This paper records the results of trials carried out in Kent during 1958, using 2 flocks of lambs exposed to natural infestation with *N. filicollis*.

Method

The sheep were kept on leys which had carried lambs infested with *N. filicollis* in the previous season. Pasture larval counts were carried out at weekly intervals from the end of March until the end of July on 2 fields on each farm, using a modification of the techniques described by Taylor (1939), and Michel and Parfitt (1955). Grass from 2 routes on each field was plucked and collected in polythene bags, each route being handled separately. The samples were weighed and small quantities at a time washed in a coarse sieve under a jet of water. All washings were collected in a 2 gallon bucket with a stoppered hole 7 mm. in diameter drilled approximately 2 cm. from the bottom. The washed sample was then soaked in water in a similar bucket for 2 hours, after which the grass was discarded and the contents of the buckets allowed to sediment overnight.

The following morning the bungs were removed and the supernatant fluid allowed to escape leaving about 750 ml. of sediment in each bucket. These deposits were combined, and after being passed through a sieve of 44 mesh to the linear inch, were poured into a Buchner funnel fitted with a Whatman No. 54 filter paper. The residue containing the larvae was filtered off under suction until just moist, the filter paper was then inverted and placed on a sieve of 100 mesh to the inch in a Baermann apparatus containing water at 30° C. After 5 days the larvae were run off and centrifugalised at 1,500 r.p.m. for 2 minutes, the supernatant fluid was discarded and a drop of Lugol's iodine added to kill the larvae which were then counted under the 2/3 objective.

This method is time saving and in theory should give a recovery rate similar to that obtained by other workers (Taylor, 1939; Michel & Parfitt, 1955). However, when Nematodirus larvae were added to clean samples of grass only a 16 per cent. recovery was obtained. It was observed that the larvae attach themselves to the sides of the Baermann funnel by their sheath tails and this may account for the large number lost during the process. A correction factor based on the recovery rate was employed to determine the number of larvae per lb. of herbage.

The lambs were weighed and faeces samples were collected at weekly intervals from the end of April until the end of July, faecal consistencies were noted, and egg counts made using a modified McMaster

technique. During the course of the observations 4 control lambs were slaughtered and worm counts carried out by means of the usual dilution method.

In both flocks the lambs were randomised into 4 groups at the start of the trials :—

Group 1 received a single dose of bephenium embonate one week after it was considered that the pasture Nematodirus larval peak had been reached.

Group 2 received 3 doses of bephenium embonate at 3-weekly intervals, starting at the beginning of May.

Group 3 was maintained throughout as an untreated control.

Group 4 was used when suitable, to test other compounds for activity against Nematodirus. In this paper the only data referring to this group are worm counts of untreated lambs.

Throughout the trials bephenium embonate was used in the form of a suspension prepared by adding water to 250 g. of a dispersible powder to give a total volume of ½ gallon. The dose of this suspension was 1½ fl. oz. for lambs under 50 lb. and 2 fl. oz. for those weighing 50 lb. or over.

Results

Field Trial I was carried out using lambs in a flock in which nematodiriasis occurred during the previous year.

The counts of Nematodirus larvae per lb. of herbage in the 2 fields sampled are shown in Fig. 1

TABLE I

FAECAL NEMATODIRUS EGG COUNTS*

	PROPHYLACTIC GROUP 2												
Lamb	8.5.58†	15.5.58	22.5.58	29.5.58†	5.6.58	12.6.58	19.6.58†	26.6.58	3.7.58	10.7.58	17.7.58	24.7.58	7.8.58
A41	0	0	0	250	0	0	0	0	0	N.S.	0	0	0
42	0	0	0	50	0	0	0	0	0	Sold			
43	50	0	0	450	0	50	350	0	0	Sold			
44	0	N.S.	0	250	0	0	0	0	0	0	0	0	0
45	0	N.S.	0	0	0	0	50	N.S.	Sold				
46	100	0	0	100	0	0	200	0	0	0	0	50	Sold
48	0	0	0	0	0	N.S.	0	N.S.	0	0	0	0	Sold
49	0	N.S.	N.S.	50	0	0	50	0	Sold				
50	N.S.	0	0	0	0	0	0	0	Sold				
51	250	0	0	300	0	0	N.S.	0	0	0	50	50	Sold
52	0	0	0	150	0	0	50	0	0	0	0	0	Sold
53	0	0	0	350	0	0	N.S.	0	Sold				
54	100	0	0	N.S.	0	0	0	N.S.	0	0	50	0	0
55	100	0	0	250	N.S.	0	100	N.S.	0	0	0	0	0
56	100	0	0	100	0	0	100	0	0	0	0	50	0
57	0	0	0	50	0	0	0	0	0	0	0	0	Sold
58	50	0	0	200	0	0	0	0	0	Sold			
59	50	0	0	0	0	0	0	0	0	0	0	100	0
60	0	0	0	100	0	0	0	0	0	0	0	0	50
61	600	0	0	200	0	0	0	0	0	0	N.S.	0	0
62	0	0	0	0	0	0	50	0	0	N.S.	50	0	0
63	50	0	0	600	0	0	N.S.	0	0	0	0	0	Sold
64	N.S.	0	0	0	0	0	350	0	0	50	100	N.S.	0
65	0	0	0	50	N.S.	0	0	Sold					
66	N.S.	0	0	50	0	0	0	0	0	0	0	0	0
67	0	0	0	0	50	100	100	0	0	0	0	0	0
68	0	0	0	0	0	0	50	0	0	0	0	0	0
69	0	0	0	0	0	0	50	Sold					
71	0	0	0	100	0	0	250	0	Sold				
72	0	0	0	50	0	0	550	0	50	50	100	0	0
73	0	0	0	350	0	0	50	0	0	0	0	0	Sold
74	0	0	0	200	0	0	150	0	0	Sold			
75	0	0	N.S.	50	N.S.	0	50	0	0	0	0	0	0
77	0	0	0	0	0	0	0	N.S.	0	0	100	0	Sold
78	0	0	0	400	0	0	0	0	0	50	0	0	Sold
79	0	0	0	50	0	0	0	0	0	0	0	0	0
80	N.S.	0	0	N.S.	0	0	50	N.S.	0	0	0	0	Sold
81	0	0	0	N.S.	0	0	0	0	0	0	0	0	Sold
82	N.S.	0	0	50	0	0	350	0	0	0	0	0	Sold
83	100	0	N.S.	300	0	0	0	0	0	0	0	0	Sold
84	50	0	0	50	0	0	0	N.S.	0	0	0	0	0
85	50	0	0	50	0	0	0	N.S.	0	0	0	0	Sold
86	0	0	0	200	0	0	0	0	0	N.S.	0	0	Sold
87	50	0	0	700	0	0	0	0	0	0	N.S.	0	0
88	0	0	0	250	0	0	150	0	0	0	50	0	0
89	0	0	0	50	0	0	200	0	0	0	100	150	100
90	100	0	0	0	0	50	50	0	0	0	50	50	0
Average	39·3	0	0	139·3	1·06	5·3	75·5	0	1·1	4·7	19·1	12·9	7·9

* Eggs per gramme of faeces. † Dose administered. N.S. No sample available.

which also indicates the grazing periods, during which the flock was always allowed access to both fields. It is evident from these counts that the sheep used for this trial were exposed to large numbers of infective larvae particularly from May 8th to June 12th.

The faecal Nematodirus egg counts of untreated animals are given in Table I together with the contrasting counts of lambs receiving the full prophylactic course of bephenium embonate. These results are summarised in Fig. 2 which shows the average faecal egg count of both groups and emphasises the high level of control achieved when 3 doses of the drug were administered. Owing to difficulty in deciding when the pasture Nematodirus larval peak

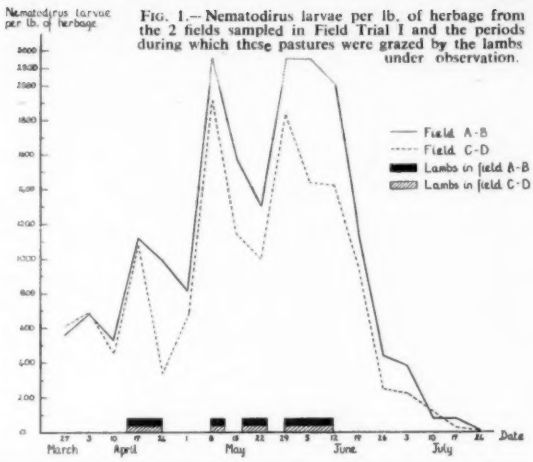

FIG. 1.—Nematodirus larvae per lb. of herbage from the 2 fields sampled in Field Trial I and the periods during which these pastures were grazed by the lambs under observation.

TABLE I

OF LAMBS IN FIELD TRIAL I

	CONTROL GROUP 3											
Lamb	15.5.58	22.5.58	29.5.58	5.6.58	12.6.58	19.6.58	26.6.58	3.7.58	10.7.58	17.7.58	24.7.58	7.8.58
A91	0	50	350	850	2,550	600	400	100	150	50	0	50
92	0	50	100	300	50	750	400	600	1,000	750	850	0
93	0	0	100	50	450	0	N.S.	500	550	50	0	0
94	200	150	50	0	500	900	500	0	0	100	N.S.	Sold
95	300	250	200	50	100	100	0	300	200	100	150	50
96	200	50	650	N.S.	1,150	1,100	0	400	N.S.	200	0	Sold
97	0	0	100	450	950	900	1,100	1,250	750	200	0	250
98	0	0	100	150	150	250	950	850	600	0	0	Sold
99	0	0	0	200	350	1,050	1,500	200	0	0	0	0
101	150	150	100	250	200	200	50	0	0	100	0	100
102	50	0	0	350	500	450	300	250	0	50	0	Sold
103	0	50	300	300	650	250	250	0	0	300	0	150
105	0	0	350	650	50	0	0	150	0	0	N.S.	0
106	0	0	50	0	100	50	100	500	350	0	0	0
107	50	50	500	1,150	300	0	200	0	0	0	0	0
109	0	0	0	50	600	0	1,200	2,150	1,150	150	N.S.	Sold
110	350	250	650	300	600	250	900	0	50	150	0	0
111	50	0	100	150	150	950	N.S	750	950	800	300	Sold
113	N.S.	0	0	150	750	100	200	350	150	200	0	Sold
114	0	150	350	400	700	1,650	600	N.S.	Sold			
115	50	100	150	50	0	0	0	0	Sold			
117	0	0	N.S.	50	600	350	1,750	Sold				
118	0	N.S.	0	250	500	N.S.	1,350	3,050	350	0	0	0
119	50	0	500	900	850	Slaughtered						
121	150	50	150	50	100	0	0	0	0	0	0	0
122	50	50	0	400	150	400	N.S.	0	0	0	0	0
123	0	N.S.	150	200	350	100	N.S.	0	100	50	0	0
124	0	0	N.S.	100	200	250	350	100	50	0	0	0
125	50	0	300	350	100	N.S.	0	Sold				
126	0	0	200	0	0	450	1,300	N.S.	0	0	0	Sold
127	0	100	350	600	1,250	1,000	200	0	100	300	0	0
128	N.S.	50	400	400	550	650	1,350	250	50	0	0	0
130	0	0	50	0	0	0	0	0	50	0	0	Sold
131	N.S.	100	300	0	0	0	0	0	0	50	100	Sold
133	0	0	0	0	250	300	850	300	350	100	100	Sold
134	N.S.	0	100	150	550	50	850	150	50	50	N.S.	50
135	N.S.	0	0	N.S.	0	250	500	500	150	0	0	Sold
136	0	0	350	350	500	950	450	1,000	1,150	1,800	850	Sold
137	0	0	200	650	1,300	700	0	500	0	0	700	0
138	150	50	650	650	250	800	1,300	100	0	0	0	Sold
140	0	0	50	50	250	0	0	300	0	50	100	100
Average	45·1	41·4	193·9	265·3	465·3	336·5	436·5	356·0	237·1	164·7	105·0	32·6

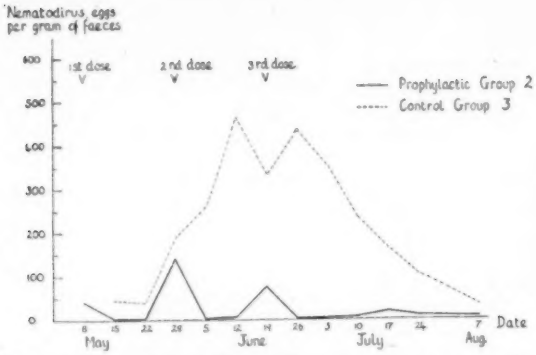

FIG. 2.—Mean faecal Nematodirus egg counts of lambs receiving 3 doses of bephenium embonate and of untreated controls in Field Trial I.

had been reached, the attempt to time the single dose in relation to this was not successful, although the lambs were divided into 2 sub-groups and dosed on different dates. However, the administration of the single dose reduced the average faecal egg count almost to zero for 2 weeks but thereafter it rose to approach that of the controls.

To determine the level of infestation in untreated lambs, 4 from Group 4 were slaughtered and worm counts made. Large numbers of Nematodirus were present in these animals and are recorded in Table II. Despite these worm burdens, clinical nematodiriasis

TABLE II
DATA RELATING TO NEMATODIRUS IN UNTREATED LAMBS IN FIELD TRIAL I OF BEPHENIUM EMBONATE FOR PROPHYLAXIS

Lamb	Eggs per gramme of faeces	Number of Nematodirus at autopsy 18.6.58			
		4th larval stage		5th larval stage	Adult
		Early	Late		
A119	3,800	2,105	2,025	4,860	32,805
A181	500	6,004	304	2,128	27,056
A213	600	6,776	2,912	3,276	26,936
A231	650	11,418	302	5,738	20,536

did not occur in this flock although all grades of faecal consistency were noted.

Statistical treatment of the data concerning egg counts and faecal consistency, using corrections calculated on a dry matter basis (Imperial Agricultural Bureaux, 1943), suggested that factors other than Nematodirus were responsible for the consistency although there was some correlation between this and the corrected Nematodirus egg count.

The weight gains of the lambs in the treated and control groups are illustrated in Table III. This shows the average weight of the lambs at the start of the experiment together with the subsequent percentage of animals each week which weighed more than 70 lb. This method has been adopted so that removal of lambs for sale did not affect the apparent weight gains in each group. Growth rate of the lambs which received the 3 doses of bephenium embonate was more rapid and even than that of the

TABLE III
FIELD TRIAL I OF BEPHENIUM EMBONATE FOR PROPHYLAXIS. WEIGHT GAINS OF LAMBS EXPRESSED AS THE PERCENTAGE OF ANIMALS OVER 70 LB.

Number in group	Group 1a 17	Group 1b 19	Group 2 47	Group 3 41
Average weight at start of trial	29·5 lb.	28·3 lb.	29·3 lb.	28·6 lb.
Date weighed	Percentage over 70 lb.	Percentage over 70 lb.	Percentage over 70 lb.	Percentage over 70 lb.
24.4.58	0*	0	0	0
8.5.58	0	0*	0*	0
15.5.58	0	0	0	0
22.5.58	5·9	0	2·1	2·4
29.5.58	5·9	0	8·5*	2·4
5.6.58	11·7	10·5	25·5	9·8
12.6.58	11·7	26·6	29·7	19·5
19.6.58	29·4	26·6	38·3*	29·3
26.6.58	35·6	31·7	51·0	34·2
3.7.58	35·6	31·7	53·1	39·0

* Dose administered.

other lambs, but, presumably because no clinical nematodiriasis occurred in the control lambs, this difference did not quite reach statistical significance.

Field Trial II was carried out using lambs in a flock in which parasitic gastro-enteritis caused by a mixed infestation of *Ostertagia* spp. and *N. filicollis.* had occurred in the previous year.

The pasture Nematodirus larval counts per lb. of herbage in the 2 fields sampled, and the grazing periods, are shown in Fig. 3. These counts show

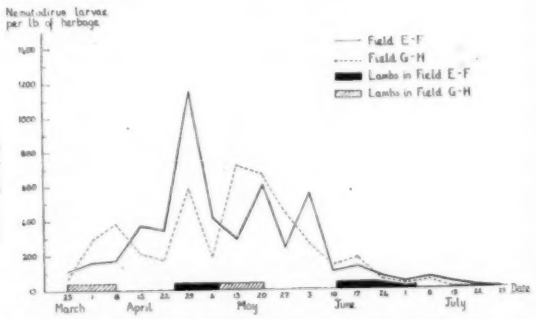

FIG. 3.—Nematodirus larvae per lb. of herbage from the 2 fields sampled in Field Trial II and the periods during which these pastures were grazed by the lambs under observation.

that the sheep used for this trial were not exposed to such large numbers of infective larvae as those in Field Trial I.

The faecal Nematodirus egg counts are summarised in Fig. 4 which shows the average weekly counts for the lambs in Groups 1, 2 and 3. Again the high level of protection afforded by the 3 doses of bephenium embonate is clearly demonstrated. Following a single dose, which in this trial was timed correctly and administered one week after the Nematodirus pasture larval peak, the average faecal egg count was reduced to zero for 2 weeks but later rose to approach that of the controls. This subsequent

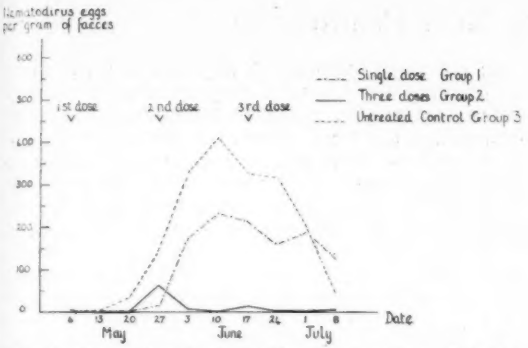

FIG. 4.—Mean faecal Nematodirus egg counts of lambs receiving a single dose of bephenium embonate, of those receiving 3 doses, and of untreated controls in Field Trial II.

rise was, no doubt, due to the persistence of high pasture larval counts.

Post-mortem worm counts were carried out during tests of other compounds using lambs in Group 4 but relatively few Nematodirus were present in the untreated control lambs as shown by Table IV.

TABLE IV

DATA RELATING TO NEMATODIRUS IN UNTREATED LAMBS IN FIELD TRIAL II OF BEPHENIUM EMBONATE FOR PROPHYLAXIS

Lamb	Eggs per gramme of faeces	Number of Nematodirus at autopsy 10.6.58			
		4th larval stage		5th larval stage	Adult
		Early	Late		
A386	550	0	0	332	7,968
A388	800	0	0	0	4,500
A411	750	168	0	0	8,232
A418	600	0	0	0	7,200

Using the same method as that adopted for the previous flock, the weight gains of the lambs in the treated and control groups are illustrated in Table V. Growth rate of the lambs receiving bephenium embonate was again more rapid and even than that of the untreated lambs but, as in Field Trial I, this difference was not quite statistically significant.

TABLE V

FIELD TRIAL II OF BEPHENIUM EMBONATE FOR PROPHYLAXIS. WEIGHT GAINS OF LAMBS EXPRESSED AS THE PERCENTAGE OF ANIMALS OVER 70 LB.

Number in Group	Group 1 20	Group 2 30	Group 3 24
Average weight at start of trial	33·3 lb.	32·6 lb.	30·3 lb.
Date weighed	Percentage over 70 lb.	Percentage over 70 lb.	Percentage over 70 lb.
29.4.58	0	0	0
6.5.58	0*	0*	0
13.5.58	0	0	0
20.5.58	0	0	0
27.5.58	15·0	16·6*	12·5
3.6.58	20·0	16·6	16·6
10.6.58	35·0	20·0	33·3
17.6.58	40·0	33·3*	33·3
24.6.58	60·0	56·6	41·6
1.7.58	65·0	66·6	45·8

* Dose administered.

Discussion

In the past, effective methods of preventing nematodiriasis have been based on the control of grazing (Gibson, 1958; Spedding, Brown & Wilson, 1958). Outbreaks of the disease have not occurred in lambs grazed on pasture maintained free from sheep during the previous year. However, under certain farming conditions, grass is scarce during the period of maximum exposure to infestation so that this method of control is often impracticable. In such cases effective preventive therapy is essential, since severe setback, particularly to fat lamb production, is unavoidable if treatment is only introduced when the disease is clinically recognisable.

The pasture larval counts of *N. filicollis* recorded in this paper indicate that a high level of infestation persists for a longer period than occurs when *N. battus* is the predominant species (Thomas & Stevens, 1956; Black, Thomas & Greasley, 1958; Gibson, 1958). Furthermore, with both species, the time of hatching varies from year to year (Baxter, 1957; Gibson, 1957; Spedding *et al.*, 1958). The danger period of exposure to large numbers of infective larvae is, however, comparatively limited, so that using efficient anthelmintics effective control can be attained, but dosing must be repeated at suitable intervals during this period. Owing to the variation in the time of hatching of *N. battus* larvae and the extended high pasture larval counts of *N. filicollis*, a single dose of bephenium embonate for prophylaxis cannot be recommended.

For maximum benefit the longest permissible interval between dosing appears to be 3 weeks, since the life cycle within the host of both *N. battus* (Gibson, 1957; Thomas, 1959) and *N. filicollis* (Gibson, 1957; Thomas, 1959; Rawes & Scarnell, 1959) can be completed during this time. One would expect the beneficial effects of this regular dosing to be cumulative in succeeding years although preventive measures to control possible recurrence of the disease should still be adopted.

No anthelmintic with greater activity than bephenium against all stages of Nematodirus has so far been described, although the value of 2 compounds of lower activity, when administered at fortnightly intervals, has been discussed (Black *et al.*, 1958).

Why clinical nematodiriasis did not occur in the control lambs, particularly in those used in Field Trial I, is not understood. Reference has already been made (Black *et al.*, 1958) to the occasional lack of correlation between high faecal egg counts and clinical signs of the disease and this has also been noted in experimentally infested animals (Rawes & Scarnell, 1959). In the trials here recorded there was also a remarkable lack of correlation between *post-mortem* faecal Nematodirus egg counts and adult Nematodirus worm counts in the control lambs, presumably occasioned by the varying stages of the host-parasite relationship.

(*Concluded at foot of col. 1 overleaf*)

Twinning in Cattle for Beef Production

We are indebted to Dr. John Hammond for the following article, on a subject of great topical interest. Some of the points made by the author may be found controversial by veterinary surgeons, but the matter is still in an experimental stage, and the results of the current trials should be awaited before conclusions are drawn.

ALTHOUGH methods for the production of twins and triplets in cattle by hormone injection were developed several years ago (Hammond, Jnr., & Bhattacharya, 1943; Hammond, Jnr, 1949), their application to normal practical farming conditions did not appear necessary until the present time.

In the special circumstances which now exist, however, these methods may have an important part to play in making possible quite an appreciable increase in our home beef production. The Argentine, our chief supplier of imported beef, is short of breeding stock, and it may be some long time before that country is able to increase supplies. For example, it has been announced that over the next 3 months the Argentine exporters will send only some 60 per cent. of the amount they did last year. In Australia too, our second largest supplier, the development of industry and home consumption is absorbing most of their increasing supplies. Moreover, both Australia and New Zealand are finding an increasing market for their supplies in U.S.A. and the Far East. Under these conditions we shall have to become more dependent on our home production. A large step forward has already been taken in this respect, but more is still required.

Before the war we were producing in this country just under 50 per cent. of our beef requirements; last year we produced about 64 per cent. This increase has come mainly from dairy herds; beef bulls were introduced into A.I. stations in 1947, and since then an increasing number of the heifers and low-yielding cows have been inseminated from them. In 1951-2 some 15 per cent. of all the inseminations made from M.M.B. centres were from beef bulls; this rose to 25 per cent. in 1956-7 and to 35 per cent. in 1957-8. Bearing in mind that over the next 4 years many TB.-infected cows will have to be culled from dairy herds, any increase of beef inseminations above about 40 per cent. would endanger the supply of dairy herd replacements, and this in turn would limit further beef supplies from dairy herds. The solution of the problem of rapid increase in beef supplies, therefore, seems to be the induced production of twins by cows bred to beef bulls. Already a large-scale field trial has been started by the M.M.B. based on their Welshpool A.I. centre to test out the results mainly on beef herds which are inseminated, while a trial is about to begin at the Cambridge A.I. centre on dairy herds and on beef herds where a bull is used.

So far as experiments have gone at present, the best technique would appear to be as follows. For dairy and artificially inseminated herds injection of P.M.S. is made subcutaneously at the 17th day after the last oestrus period. It is necessary to do it at this time when the corpus luteum is beginning to die away in preparation for the next heat period, for if the injection is made when there is an active corpus luteum in the ovary the follicles will not rupture but will develop and may produce cysts. The dose required to produce, on the average, twin ovulations has not yet been definitely determined for all breeds and ages of cows, but it will depend on what sort of preparation of P.M.S. is used. For Dairy Shorthorns the dose is about 2,000 I.U. for the chemically purified product such as is used in human medicine, about 1,000 I.U. for the freeze-dried preparation, and only about 800 I.U. for frozen (−10° C.) raw serum. Experiments on the comparative potency of the various preparations have been made for cattle by Rowson (1951) and for sheep by Gordon (1958). The probable reason for these differences is that the I.U. assay is carried out on rats in which the reactions

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Bephenium Embonate in the Prevention of Nematodirus Infestation in Lambs—*Concluded.*

Clinical nematodiriasis occurred in control untreated lambs maintained during trials of bephenium embonate for the prophylaxis of a predominantly *N. battus* infestation in which the recommended dosing routine at 3-weekly intervals prevented the disease (Black, 1958). There is, therefore, considerable evidence that the bephenium salts are of unparalleled value not only in the treatment of nematodiriasis but also for its prevention, a course to be strongly recommended because of the acute nature of the disease.

Acknowledgments.—We would like to acknowledge the help received from :—

1. Numerous colleagues in the Wellcome Foundation, particularly Mr. S. L. Hignett, Mr. D. Stevenson, Mr. P. A. Young, Miss A. J. Bescoby, Miss G. Harland, Miss W. A. Morley, Miss G. C. Wrapson and Miss G. C. Young.

2. Mr. J. D. Paterson, M.R.C.V.S., Mr. G. S. Peyton, M.R.C.V.S., Mr. P. M. F. Sambrook, B.SC., M.R.C.V.S., and

3. Mr. C. Jessel and Mr. J. Starkie who provided the facilities for the field observations.

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are very much quicker than in the cow, which requires about 4 days to ripen follicles. Chemically purified F.S.H. from the anterior pituitary is destroyed very quickly by the body so that if this is used injections have to be made every 12 hours for about 4 days. It would appear, therefore, that chemically purified P.M.S. may be destroyed more quickly than the raw serum, possibly because the nature of the protein to which the hormone is attached is altered by the mode of preparation. There are dangers in giving an overdose, for in some cows 4 or even 5 calves may be produced. It would be advisable when starting trials to begin with doses on the low side and work up to the dose which produces twin ovulations in the particular age or breed of cow concerned. If more than two embryos result an expert can rupture the excess amnionic sacs when diagnosis is made at 35 days.

For beef herds where a bull is run with the herd the procedure requires much more technical skill because it is more difficult to detect heat and so tell when the 17 days from the last heat will be. Rowson and Lamming found from experiments made about 1951 that the best method was to squeeze out the corpus luteum from all those cows where a large and active corpus luteum was present, and at the same time inject the hormone. These cows could then be turned out with the bull and would be served within about 4 days. The remaining cows which had no large corpus luteum present could be examined again and treated in the same way some 14 days later.

Whether, and the extent to which, multiple ovulation has been caused can be discovered by rectal palpation of the ovaries some 10 days after the heat which succeeds the injections. Such information can be of use in regulating dose in subsequent injections in similar herds. By about 35 days after service it should be possible to determine whether one or more foetuses are present in the uterus by rectal palpation; if only one foetus is present, one uterine horn will be larger than the other, whereas, if more are present, the uterine horns will be more or less equal in size.

It should be pointed out that the method is suitable for the production of calves for beef only, and not for heifer replacements for the dairy herd. Where the twins are of opposite sexes, the sex organs of the female are switched over to the male side and give rise to freemartins. In treated herds, therefore, the extra calves obtained are either bull calves or freemartins, the same number of normal females (where both twins are heifers) being produced as in non-twinning herds.

In dairy herds there is a prejudice against twins, the main reasons advanced for this being that twinning "takes it out of the cow" and she is in poor condition after calving and gives less milk, that the twins are weakly and do not survive as well as singles, and that the cleansings are frequently retained. All these things occur in ewes bearing twins and triplets when they are badly fed during the last 6 to 8 weeks of pregnancy, but as Wallace (1948) has shown, they can be put right by feeding the ewe well during this period.

The early experiments which were done with twinning in cattle indicated that these results obtained with ewes applied equally to cows. The incidence of retained cleansings is more frequent when premature births occur; if the dam is undernourished during the latter stages of pregnancy, the foetus will be physiologically immature in spite of its chronological age. To obtain successful twin births it is, therefore, necessary to increase the cow's ration during the last 8 weeks of pregnancy to cover the demands of an extra calf and its associated foetal membranes.

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THE CENTRAL VETERINARY SOCIETY

A paper of unusual interest will be read at the meeting of the Central which is to be held on March 5th at the Royal Veterinary College. The subject is "Biological Spare Parts," and the lecturer Mr. W. J. Dempster, F.R.C.S., of the Department of Surgery, Post-graduate Medical School. All members of the profession are invited, and it is hoped there will be a large attendance.

CONTROL OF FOOT-AND-MOUTH DISEASE

On Tuesday, Wednesday, and Thursday of this week there have been meetings at the Royal College of Veterinary Surgeons of the Executive Committee of the European Commission for the Control of Foot-and-Mouth Disease. There were present:—

Dr. van den Born (Netherlands), Dr. da Rosa Azevedo (Portugal), Dr. Ademollo (Italy), Dr. Oral (Turkey), Mr. J. N. Ritchie (United Kingdom), *executive committee members;* Professor Vuillaume (France) and Dr. Duhaut (Belgium), *invited guests;* and Dr. E. Fogedby, Miss D. Guarino, and Sir Thomas Dalling, *secretariat.*

On Tuesday evening, the President of the Royal College, Professor T. J. Bosworth, gave a sherry party at the College in honour of the foreign delegates, and amongst those present were: Dr. R. E. Glover, Professor L. P. Pugh, Mr. J. N. Ritchie, Mr. A. D. J. Brennan, Professor W. I. B. Beveridge, Mr. W. G. R. Oates, Lord Waldegrave, Mr. A. J. D. Winnifrith, Sir Richard Manktelow, Mr. J. Hensley, Mr. W. C. Tame, Mr. C. P. Quick, Dr. E. Cotchin, Dr. I. A. Galloway, Dr. R. Scarisbrick, Mr. J. W. Salter Chalker, and Mr. S. W. Cheveley. It was particularly pleasant that the Permanent Secretary (designate) of the Ministry of Agriculture, Mr. A. J. D. Winnifrith, was able to come from the Treasury and have his first introduction to the veterinary profession.

On Wednesday evening, Her Majesty's Government gave a Reception in honour of the Committee at which Earl Waldegrave was the host.

The many friends of Sir Thomas Dalling will be glad to know that he has now recovered from a serious operation which was performed some weeks ago and was present at the Conference.

Ganglionic Lesions in Grass Sickness of Horses

BY

LEO W. MAHAFFEY

The Animal Health Trust,
Equine Research Station, Newmarket

SUMMARY.—Histological examination of the ganglia of the autonomic nervous system of 4 horses affected with grass sickness revealed extensive degenerative changes in the neurones. These were similar to those described recently in Sweden by Obel (1955).

They appear to be the essential lesions of the disease and to offer an explanation of the clinical symptoms, course, and resistance to therapy.

THERE is a very extensive literature on grass sickness in horses and formerly a great deal of work was done in an endeavour to elucidate the essential nature and cause of the condition. The last review of current knowledge of the ailment was that by Greig (1942) and in it he speculated at length upon the aetiology and took the view that a filtrable virus was the most likely cause.

Greig recorded that the disease first appeared in Scotland in 1911 and that it has always been most prevalent there and in England north of a line drawn roughly from Morecambe Bay to Flamborough Head. Abroad, it is said to occur in Brittany and West Flanders and it is reported as being known in Sweden since 1919 (Obel, 1955).

It is a condition peculiar to horses in which it may affect all breeds of any age, except perhaps sucking foals. There is usually, but not invariably, a history of access to growing grass.

Clinically there are acute, subacute, and chronic forms all of which Greig (1928) considered to be very largely different expressions of "sympathicotonia." There is lethargy and somnolence, difficulty in swallowing, and inactive bowels which may at first suggest subacute impaction of the colon. Fine muscular tremors over the shoulders and flanks are very common and there may be periodic patchy sweating. As the disease progresses there is great loss of condition and the abdomen becomes markedly "tucked up." The muscles of the trunk and quarters become very hard to the touch and in the male the penis may become pendulous.

The mortality rate is very high and complete recovery very rare. The general deterioration over a period of a week or two is so great that destruction is frequently unavoidable.

At *post-mortem* examination, the gross lesions found depend upon the stage at which death occurs. In early cases there may be acute distension of the stomach with fluid and impaction of the large colon. In subacute and chronic cases the whole gastro-intestinal tract may be depleted of its normal content and become remarkably small in diameter. The spleen is often much enlarged but there are no consistent changes which one might consider to be of a primary nature.

So far as the microscopical findings were concerned Greig's (1942) summing up was that "extensive histological investigations carried out over a period of years have failed to determine the regular occurrence of any microscopic lesion."

It remained for Anna-Lisa Obel (1955), in Sweden, to describe what are almost certainly the essential lesions of this disease. The purpose of this short communication is to confirm that the very important pathological findings described by her in the sympathetic ganglia occur also in typical cases of grass sickness which have been examined at Newmarket.

Occurrence of Grass Sickness in Race-horses

Greig (1942) observed that "It is only on rare occasions that cases are encountered in stabled animals, even in those to which grass cut from affected pastures is fed," and he went on to make the point that even when cases were occurring in the epizootic area their occurrence in adjacent towns, where large numbers of stabled horses were kept, were regarded as "quite remarkable." Nevertheless, there are many reliable reports of its sporadic occurrence in stabled horses in many parts of Britain.

It must be considered quite uncommon amongst race-horses or brood mares at Newmarket and in other racing centres in England but occasional cases are encountered from time to time and 6 definite ones have been noted during the past 4 years. Of these, the author had personal acquaintance with 5 and performed an autopsy on 4. At the time of the *post-mortem* examination the disease had passed into a very well established or chronic form in which the clinical signs were quite unmistakably manifestations of grass sickness.

The animals concerned were:—

(a) An 8-year-old 'chaser;

(b) a 6-year-old stallion which showed symptoms the day after a race in which it had been fancied to win, but performed poorly;

(c) a 6-year-old pregnant brood mare;

(d) a 3-year-old filly in full training which showed the first symptoms a day after a race in which she had finished second.

All 4 had shown symptoms which were at first taken for subacute impaction colic. However, each deteriorated under treatment and all developed difficulty in swallowing, patchy sweating, and muscular tremors without evidence of fever or severe abdominal pain. In 3, some of the groups of muscles over the quarters were very hard to the touch and in 2 intermittent salivation was a marked feature. No impaction could be felt upon rectal examination and in case (d) this procedure at first provoked considerable straining. In both the males the penis became pendulous. All wasted in bodily condition to the degree of becoming little more than walking skeletons.

No biochemical or haematological abnormalities

LEO W. MAHAFFEY.—GANGLIONIC LESIONS IN GRASS SICKNESS OF HORSES

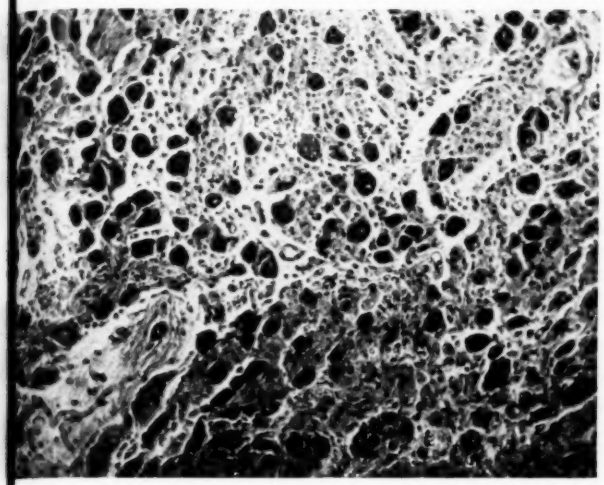

FIG. 1.—Normal superior cervical ganglion of yearling put down because of limb deformities. ×50.

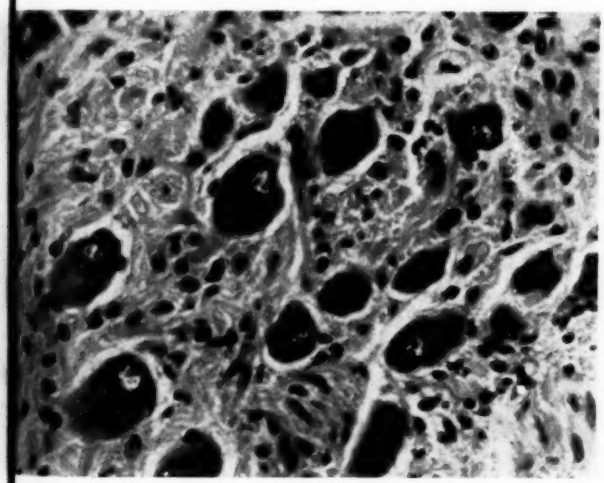

FIG. 2.—Same normal ganglion as 1. ×100.

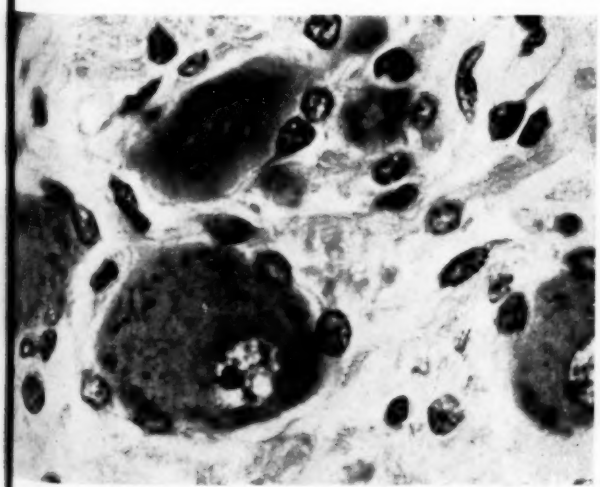

FIG. 3.—Same ganglion as Figs. 1 and 2. ×450.

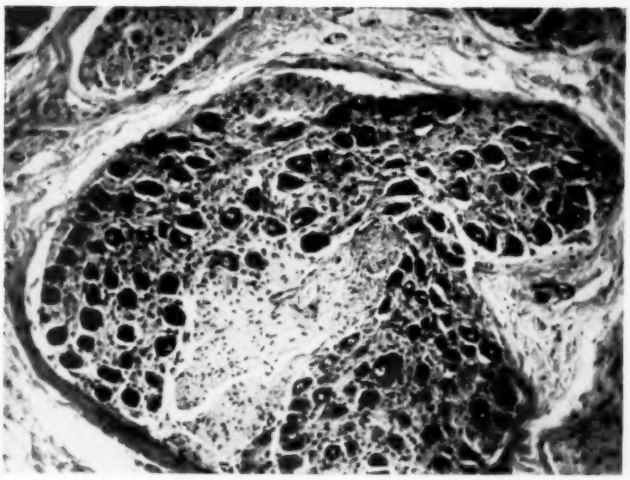

FIG. 4.—A normal coeliaco-mesenteric ganglion of a yearling destroyed because of limb deformities. ×50.

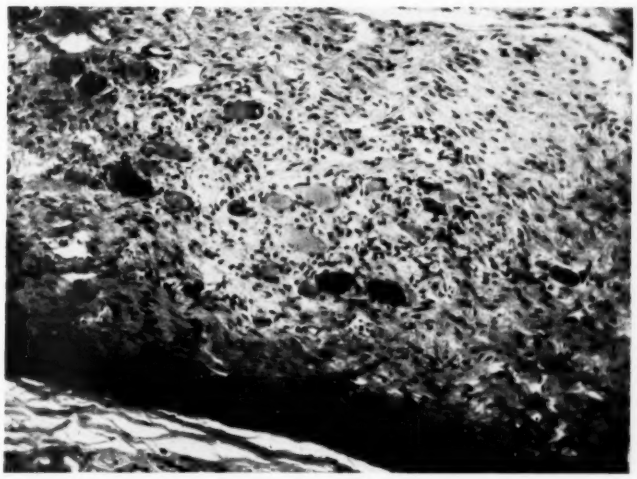

FIG. 5.—Left stellate ganglion from a case of grass sickness.

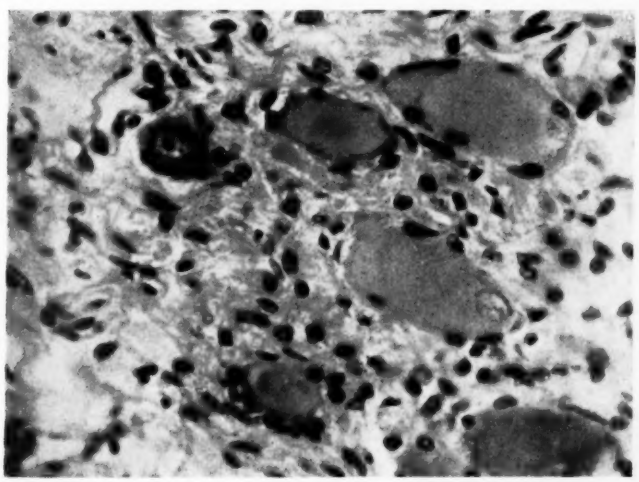

FIG. 6.—Same ganglion as Fig. 5. Note the neurones showing chromatolysis. ×100.

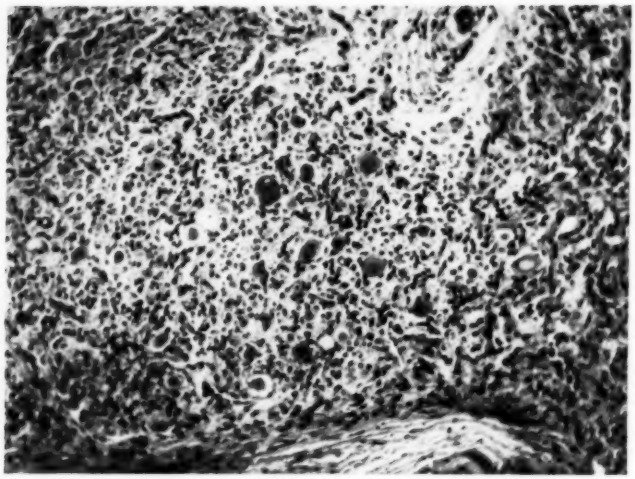

FIG. 7.—Coeliaco-mesenteric ganglion from a case of grass sickness. There is only one normal neurone, near the centre of the field. The remainder show all grades of cell degeneration. ×50.

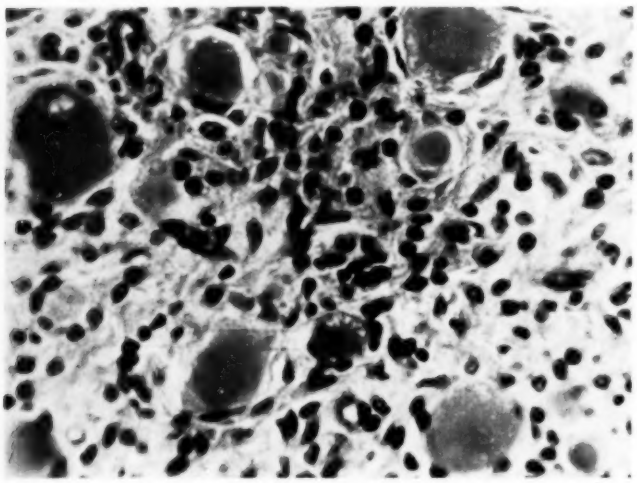

FIG. 8.—Same ganglion as Fig. 7. Note the dead disintegrating neurones. No Nissl substance, no nucleus, "foaminess" of cytoplasm, vacuolation, and two small shrunken residues of cell bodies. ×100.

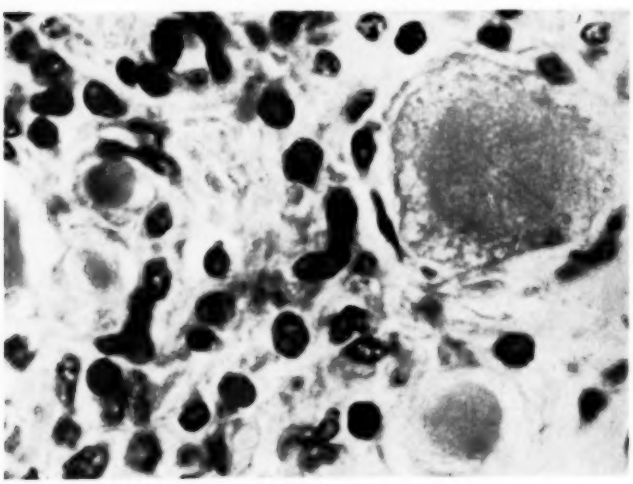

FIG. 9.—Different views of cells of coeliaco-mesenteric ganglion showing severe degeneration of neurones. ×450.

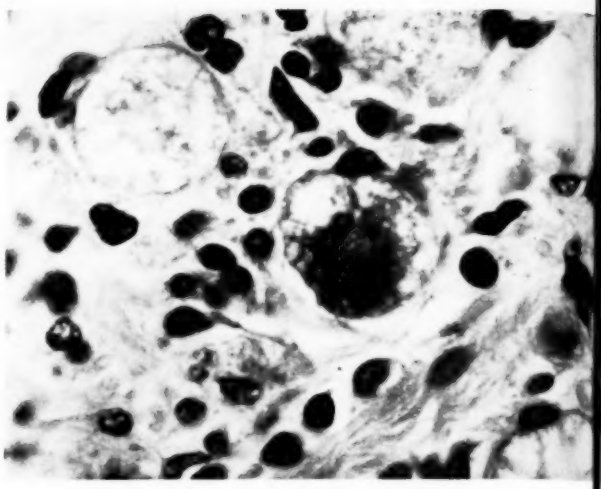

FIG. 10.—Different views of cells of coeliaco-mesenteric ganglion showing severe degeneration of neurones. ×450.

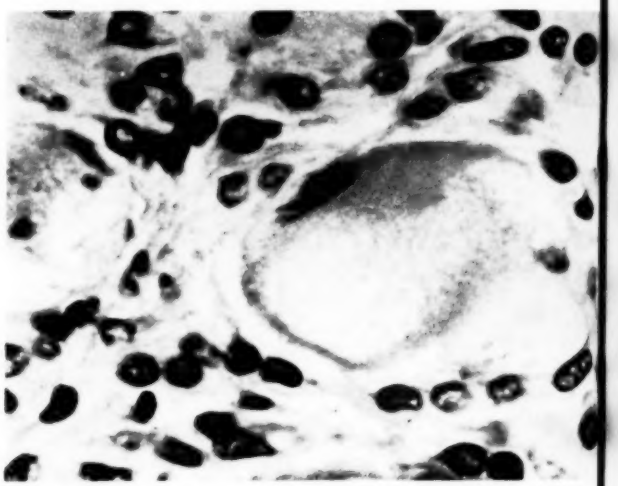

FIG. 11.—Different views of cells of coeliaco-mesenteric ganglion showing severe degeneration of neurones. ×450.

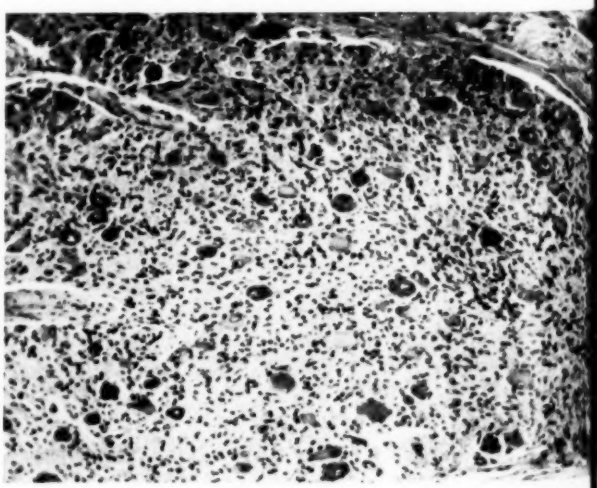

FIG. 12.—Posterior mesenteric ganglion from a case of grass sickness. Showing many degenerating neurones. ×50.

were detected although a wide range of determinations were performed. This is in accord with the results of previous work.

At autopsy there was a very large spleen in 3 of the 4 cases and all had a gastro-intestinal tract which appeared very small. In one, there was marked inflammation of the pharynx and some suppuration over the turbinates. This was associated with the inability to swallow properly and the consequent rejection of some of the ingesta through the nasal passages.

Sections of various organs were taken and the following sympathetic ganglia were dissected out:—

(i) The superior cervical;

(ii) the blended inferior cervical and first thoracic (ganglion stellatum);

(iii) two or 3 of the ganglia situated along the thoracic part of the trunk;

(iv) the coeliaco-mesenteric and

(v) the posterior mesenteric.

Corresponding ganglia from normal horses and those suffering from diseases bearing no resemblance to grass sickness have also been studied. Those from the normal horses were taken from subjects in apparently perfect health which were destroyed because of abnormalities involving the limbs.

Nerve material was fixed in Carnoy's fluid and paraffin sections were stained with haematoxylin and eosin and with Einarson's gallocyanin. More extensive work with the ganglia chosen and with other parts of the nervous system was not undertaken since a study of the disease has not been part of our research programme.

Appearance of the Neurones in Normal Sympathetic Ganglia

There is a range of variability in the appearance of the neurones in normal animals which depends largely upon their activity at any particular moment (Obel, 1955). The author has been unable to study these variations in normal horses but the changes encountered in established cases of grass sickness are well beyond the normal range. As seen in haematoxylin and eosin-stained paraffin sections, the normal nerve cell bodies are either ovoid, somewhat triangular, or irregularly quadrilateral in shape. They are quite variable in size in different ganglia and even within the one ganglion. The cytoplasm is only slightly acidophilic (or neutrophilic) in appearance, the Nissl substance is markedly basophilic and is plentiful throughout, often tending to be concentrated around the periphery. The nucleus is spherical and in our material has definitely tended to an eccentric position in well over 80 per cent. of cases where it was visible. Because of the thickness of the cell it may be invisible in about 30 per cent. of the neurones in many thin sections. This, however, does not lead to any confusion in assessing the state of the cell since the cytoplasm in such cases appears quite healthy. There is a prominent, spherical nucleolus (sometimes 2) and the chromatin network is often scanty, giving a reticular appearance. At first sight the blood vessels in the surrounding supporting tissue are inconspicuous but when examined closely there are numerous very tiny ones, often containing only one or two erythrocytes in cross section. The connective tissue is quite cellular and Van Gieson staining shows a fine collagen stroma. The author has not encountered leucocytes in it.

The Neurones in the Sympathetic Ganglia in Grass Sickness

Obel (1955) examined the ganglia from 14 cases of grass sickness and in her paper she has given a comprehensive description of the lesions together with 24 microphotographs. Through her courtesy and kindness we have had the advantage of examining some of the sections from these Swedish cases and as a direct result we have been able to confirm that our own 4 English cases were similar pathologically.

In the latter, the abnormal neurones in most of the ganglia were very readily visible with the low power of the microscope. In most fields all grades of cell degeneration from early chromatolysis to death and disintegration were encountered. In some instances up to 75 per cent. of the cells of the ganglion were distinctly abnormal. With the disappearance of the Nissl substance the cytoplasm became increasingly eosinophilic and many neurones were left as structureless, bright pink, distorted masses lacking a nucleus and often shrunken into circular bodies with an empty space between them and their former capsular cells. Between the extremes one encountered "foamy" cytoplasm and cells containing tiny cytoplasmic vacuoles. No large vacuoles occupying almost the entire cell were observed. In this small series it was not possible to conclude whether one particular ganglion was generally more severely affected than another. The various changes can be seen clearly in the accompanying microphotographs. Nothing bearing any resemblance to the over-all picture was seen in animals suffering from several other chronic diseases (nephritis, chronic enteritis of unknown cause, and wasting).

No changes in the perineuronal capsular cells or the interstitial connective and fibrous tissue between individual nerve cells were observed. In particular, hyperaemia and an influx of leucocytes or other phagocytic cells were not apparent.

Conclusion

At the present stage one cannot do better than quote Obel (1955), "The changes found in the ganglion cells of the vegetative nervous system in grass disease explain the severe clinical course with marked resistance to all therapy. They resemble those caused by neurotropic viruses. Insufficient is known of the way in which nerve cells react to different agents to draw definite conclusions as to the aetiology. The possibility of intoxication can, therefore, not be excluded, especially as grass disease has, as yet, not been transmitted."

Acknowledgments.—We wish to acknowledge the extreme kindness of Dr. Anna-Lisa Obel for sending us sections from her cases. Thanks are due to Dr. R. K. Archer of this Station for the photographs.

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Current Literature

ABSTRACTS

Cortisone and Anaphylaxis. TRETHEWIE, E. R. (1958). *Austral. J. exp. Biol.* **36.** 275-84.

This report concerns the effect of cortisone on the release of histamine and S.R.S. (slow reacting substance) in anaphylaxis, and discusses the mode of action of salicylate and cortisone in conditions such as rheumatic fever, asthma, and acute rheumatic arthritis in which allergy plays a part in the production of symptoms.

Tests for histamine and S.R.S. were done on the isolated guinea-pig jejunum, and cortisone at doses of 1:4,000 up to 1:10,000 had no inhibitory effect on the release of histamine and S.R.S. in anaphylaxis, but depressed the response of the gut to histamine and S.R.S. at concentrations of 1:7,000 up to 1:140,000.

In man cortisone at a daily dose rate of up to 150 mg. would not reach the concentration of 1:140,000 shown here to be required to reduce the gut response to histamine, although this dose rate given over a period would be adequate to reduce the amount of circulating antibody by inhibiting antibody production and so ultimately to ameliorate the allergic response.

Soluble hydrocortisone sodium memisuccinate, which may be given by rapid intravenous injection should achieve the high blood level required to suppress the peripheral reaction to histamine.

Comparing the modes of action of salicylate and cortisone in the suppression of the allergic response it is concluded that salicylate acts by suppressing the antigen—antibody reaction, thus inhibiting the release of histamine and as this effect is obtained in the isolated organ it cannot operate through the release of cortisone. W. M. B.

Surgical Removal of Canine Heartworms by Pulmonary Arteriotomy. ROENIGK, WILLIAM J. (1958). *J. Amer. Vet. Med. Assoc.* **133.** 12, 581-5.

As a result of the hazardous procedure involved in the chemotherapeutic treatment of dogs heavily infected with heartworm — *Dirafilaria immitis*, various methods have been evolved for the removal of the worms surgically. In this paper a brief résumé of these earlier methods is given, followed by the method adopted by the author. Briefly, this consists of exposing the heart at the left fourth intercostal space. Rib resection was not considered necessary; the use of a self retaining retractor permitted adequate exposure. A Satinsky clamp was placed longitudinally on the pulmonary artery without obstructing the arterial flow to the lungs. A 1.5 to 3 cm. longitudinal incision was made into the clamped portion of the artery after the anterior and posterior vena cavae had been temporarily ligated. Usually 1 minute was ample time for the removal of 30 or more adult heartworms—a further 2 minutes being required to search the smaller branches of the pulmonary artery and the ventricle for further worms. The pulmonary artery was closed with continuous sutures using arterial silk.

A Table is published showing a summary of the results of operations on 36 dogs of which only 3 died. This also shows the ages of the dogs treated which varied from 1 to 15 years, and that anything from 1 to 57 adult worms could be removed by this method. The author then discusses the various cases operated upon, and concludes with the opinion that in comparison to chemotherapy, surgery may be a safer procedure in the case of the severely affected older dog. J. S. J. L.

The Skeletal Muscles of Sheep Affected with Scrapie. HULLAND, T. J. (1958). *J. comp. Path.* **68.** 264.

Detailed examination of skeletal muscles from 30 sheep affected with scrapie and 12 sheep which were believed not to be affected with scrapie failed to support the view that muscle changes play a part in producing clinical scrapie.

The Histopathology of the Brain Stem of Sheep Affected with Natural Scrapie. ZLOTNIK, I. (1958). *J. comp. Path.* **68.** 148.

Eighteen serial sections from each of 3 sites in the medulla were examined from 70 sheep affected with scrapie and from 70 apparently healthy sheep. Results presented are from 10 sheep with advanced scrapie, 10 showing early symptoms of scrapie, and 10 healthy sheep of comparable ages; it is stated that these results are typical of those from the whole group.

The number of vacuolated neurones in the scrapie sheep was much higher than in healthy sheep and possible causes of this vacuolation are discussed. Vacuoles are more numerous in advanced cases. Some, but not all, of the vacuolated neurones showed degeneration, and astrocytic proliferation in the grey matter was common. Perivascular demyelination was present in 70 per cent. of advanced cases but in only 20 per cent. of less severely affected sheep. G. B. S. H.

Public Health Aspect of Tuberculosis in Domestic Animals. SOLTYS, M. A. (1958). *Brit. med. J.* November 8th. 1133-6.

This paper is the substance of an address to the British Tuberculosis Association given in Cambridge on March 28th, 1958.

After dealing with the effect of the industrial revolution on the concentration of dairy cattle around centres of population to supply them with milk, the paper goes on to deal with tuberculosis in cattle. Progress in the eradication of bovine tuberculosis is outlined and the effect of the human and bovine strain in cattle explained. Tuberculosis in sheep and goats is briefly discussed. The disease in pigs presents a problem largely related to the incidence of bovine tuberculosis. Accurate statistics of tuberculosis in horses are not freely available but the incidence of the disease is not high and may well decline due to the reduction in incidence of both bovine and human tuberculosis.

Though tuberculosis of dogs is, according to the

paper, relatively rare, the presence of a tuberculous dog in a household is a potential source of infection. The paper does not bring out that, not infrequently, it is the dog that has been infected by one of the household. Tuberculosis in cats receives a brief mention, it being emphasised that the cat has a strong resistance to infection with the human and avian type but is susceptible to the bovine type. With the exception of pets such as parrots and the canary in which the human type is sometimes encountered, tuberculosis in birds is caused by the avian type. There is a brief reference to tuberculosis in captive wild animals.

The paper concludes with a discussion of the public health aspects of tuberculosis in the species mentioned. G. F. B.

The Chronic Radiation Syndrome. COLLERY, L. (1959). *Irish Vet. J.* **13.** 1, 2-7.

Experimental atomic detonations and effluent from atomic plants causing a slow but continual accretion to the natural radiation background are described by the author as the chronic radiation syndrome.

One important question which at the moment is occupying the attention of the experimental stations in this country and in America is whether all irradiation should be regarded as harmful or whether there is a threshold below which no harm results. One experiment which has been in progress at the University of Utah involves over 100 beagles. These animals are subjected to intravenous injections of radium, plutonium, radiothorium and strontium 90, most of which are alpha emitters. During the early months following administration, indefinite symptoms of alimentary upsets are seen, clinically indistinguishable from those observed in normal young dogs. The first definite symptom resulting from the irradiation is an osteoporosis. This at first affects the spinal processes of the anterior dorsal vertebrae, but later spreads to the mandibles, followed by an alveolar periostitis with subsequent loss of teeth. Changes in the eye also occur. In the iris this takes the form of a lamellar depigmentation so that the whole iris gradually turns grey. Changes in the tapetum also cause a depigmentation of this structure.

Similar experiments are also being conducted at the University of Tennessee where about 150 burras are being used. J. S. J. L.

REPORT

Annual Report of the Department of Veterinary Services and Animal Industry, Nyasaland, 1957.

In his Annual Report for 1957 the Director of Veterinary Services, Mr. D. E. Faulkner, D.V.M., F.R.C.V.S., DIP.AGRIC., gives a concise account of the activities of his Department during the year, activities which covered all aspects of the livestock industry in Nyasaland from disease control to animal husbandry and livestock improvement. It is evident that a great deal of very useful and valuable work is being accomplished by a relatively small Department containing only 13 veterinary surgeons and 18 Livestock Officers.

The land area of Nyasaland is about 37,000 square miles, slightly less than that of Scotland and Wales together. The country is divided for administrative purposes into 3 Provinces—North, Central and South. Its human population comprises approximately 2.3 million Africans and 8,000 Europeans and Asians. In 1957 the domestic livestock, about 98 per cent. of which is owned by Africans, consisted of 328,000 cattle, 361,000 goats, 58,000 sheep and 89,000 pigs. Equine animals are limited to about 100 horses, none of which are African-owned, and 400 donkeys.

Despite an unusually long and severe dry season the year was a good one for stock and mortality was generally low. Tick-borne diseases constitute the main threat and consequently considerable emphasis is being placed on extending dipping facilities in the Protectorate. During the year a scheme, financed from Colonial Development and Welfare Funds, to provide 43 more dipping tanks was started. An enterprising feature of the scheme is that the tanks are delivered to the site as prefabricated steel sections. These are bolted together above ground and the tank then lowered into a carefully dug hole. The containing walls of the tank, the dip store, mixing tank and an adjoining veterinary assistant's house are constructed from concrete blocks manufactured on the site. The constructional details of the dips are well shown by some good photographs in the Report. By the end of the year 7 dips had been completed, a rate of progress well in advance of schedule.

East Coast fever remained the most important tick-borne disease, some 140 outbreaks being recorded. Outbreaks of redwater and anaplasmosis were also encountered. Heartwater was particularly prevalent and caused heavy losses in sheep; in this class of livestock onset of the disease was so sudden and its course so rapid that the only means of controlling outbreaks was to treat in-contact and healthy sheep. The Report suggests that the prevalence of this disease may be a notable factor in the drop in the country's sheep population over the past few years. Heartwater in cattle, if detected early enough, proved amenable to sulphamezathine or terramycin therapy.

Some Endemic Diseases

A resurgence of trypanosomiasis, due mainly to *T. vivax*, occurred in the northernmost tip of the country; some cases may have been aggravated by a concurrent infection of foot-and-mouth disease. Other known fly belts did not prove excessively troublesome and the disease was kept in check with dimidium bromide or antrycide, both of which gave good results.

In August an outbreak of foot-and-mouth disease, the first ever recorded in Nyasaland, occurred as a result of contact with infected cattle on the Tanganyika border. Type 0 strain was shown to be involved, the first time this strain has been found so far south in Africa. Morbidity was high but mortality practically non-existent and by quarantine measures and artificial infection of the 4,000 in-contacts to shorten its duration the outbreak was stopped in about 2 months.

Rabies continued to be prevalent, 53 cases being

confirmed; mainly dogs were involved but the disease also occurred in cats, cattle and one sheep. Vaccination is proving of value in townships, where it is a compulsory preliminary to dog licensing; the intention is to extend vaccination to infected rural areas in 1958.

Newcastle disease in poultry has spread rapidly during the past two and a half years and is now regarded as being enzootic throughout the country. Commercial flocks are protected by six-monthly vaccinations but this course is impracticable in native village flocks. In the circumstances there would seem to be a good case for using an egg-adapted fixed attenuated virus vaccine such as has given excellent results in Malaya and other Asian countries and which gives an immunity that is virtually life-long with one injection.

Other diseases encountered and mentioned briefly in the Report included lumpy-skin disease, tuberculosis, contagious abortion, sweating sickness, various clostridial infections, virus pneumonia and coccidiosis. The central laboratory at Blantyre was concerned primarily with diagnosis and examination of field specimens; fowl typhoid vaccine was the only vaccine produced at the laboratory. Two small field laboratories were maintained in the Central and Northern Provinces. A comprehensive survey of helminths, which as in most other tropical countries are a major cause of unthriftiness in stock in Nyasaland, was started during the year.

Livestock Improvement

Animal husbandry work was directed mainly to the furtherance of the scheme for subsidising improvements of the native cattle *kholas* in rural areas, to attempts at improving grazing areas, and to the further development of the three Livestock Improvement Centres, one in each Province, at Mikolongwe, Chitedze and Mbawa. Native Angoni, Nyasa Zebu, Friesian and Jersey herds were maintained at these Centres, as well as indigenous sheep and goat flocks. Production records are given in Appendices to the Report.

At Mikolongwe a poultry centre has been established from which birds were distributed on sale. No mention is made in the Report of the breeds used but the increase in sales during the past 3 years suggests that the enterprise is supplying an obvious need of reasonably priced breeding stock for African poultry rearers.

At the three Livestock Improvement Centres training courses were run for veterinary assistants, and short courses for native authority councillors, headmen, farmers and others.

The increasing human population imposes a greater demand on slaughter stock each year. To meet this some cattle were imported from neighbouring territories and during the year arrangements were made for an extension of cold storage and abattoir facilities in Nyasaland by the Cold Storage Commission of Southern Rhodesia with the object of relieving the growing pressure on the local stock populations.

In 1956 300 donkeys were imported from Southern Rhodesia in order to alleviate the great shortage of animal transport in Nyasaland. Some difficulty was experienced in supplying the number of simple harnesses required but despite this over half the donkeys were sold to local farmers during the year under review.

The Report concludes with 12 Appendices of statistical information on the livestock industry in the country. W. E. L.

News and Comment

SPECTACLES FOR HORSES

We are indebted to a member of the profession for sending us the following, which appeared in the form of a pamphlet, and is dated 1891. The wording is re-published by kind permission of Messrs. Dollond & Aitchison.

Spectacles for Horses

Manufactured by

DOLLOND & CO.,

35, *Ludgate Hill, London.*

To Remedy SHYING, and to Promote HIGH-STEPPING.

Introductory Notice

This subject was first introduced to us by a German largely interested in the breeding and training of horses. On investigation we found that certain lenses were capable of producing peculiar effects—one being that a level road appeared to rise immediately in front, so that the wearer was induced to step up; this led to the idea of using Spectacles to promote high-stepping in young horses. No doubt many will smile at the idea of Spectacles being used by horse trainers, but it must not be lost sight of that Science has done much in the past which was previously ridiculed,—and that much is still to be accomplished no one will deny.

It is not high-stepping, however, which has induced us to investigate this subject, but **Defective Sight.** There can be no doubt but that Myopic Sight—commonly known as "Short Sight"—and other peculiarities of vision are to be found among horses as well as human beings, and it is more than probable that Shying is the result of short sight, for under such conditions things in the distance are not seen clearly, and the animal starts when strange objects come suddenly within the focus of its sight, while those with normal vision become acquainted with distant objects, and pass them without fear. If, therefore, we can establish as a fact that defective vision is not uncommon among horses, surely Science can step in and to some extent determine the nature of the defect! With reference to the human eye, the Oculist with his Ophthalmiscope can quickly estimate the errors of refraction or detect other defects without a word from the patient. We contend, there-

fore, that the eye of the horse should, by the same process of examination, be as thoroughly understood. *Spectacles,* when properly constructed, do not look unsightly on the horse, certainly much less so than the band which is frequently placed over the eyes of a shying horse. The glasses are of a deep saucer shape, completely covering the eye; they can be attached to the inside of and standing at right angles to the "blinkers," and kept in their places by means of thin straps.

When Spectacles are to be used to promote high-stepping in young horses, the glasses are fitted in "bosses" of leather, quite enclosing the eyes, light being admitted only through the glasses. It is suggested that the training should commence early, not waiting until the animal is over two years old. None but thoroughly competent persons should undertake the task of this special work, and such persons should have an unlimited stock of good temper, combined with sufficient scientific knowledge, in order to make good use of the instruments placed at their disposal.

Price of the Spectacles, 30/-

December, 1891.

DR. HENRY DRYERRE

In addition to his former students there must be many members of the veterinary profession who learned with regret of the death of Dr. Henry Dryerre in his seventy-eighth year.

In early life a pharmaceutical chemist, Dr. Dryerre took the medical qualification of M.R.C.S. (Eng.) and L.R.C.P. (London). In 1919 he was appointed a lecturer in Experimental Physiology under Sir Edward Sharpey-Schafer, in Edinburgh University, an appointment which he held until 1930. In 1919 he was appointed Professor of Physiology in the Royal (Dick) Veterinary College on a part-time basis. In 1930 Dr. Dryerre was appointed Biochemist to the Animal Diseases Research Association, holding this post concurrently with his Professorship in the Dick until 1935. In 1935 the Professorship of Physiology in the Dick was made a full-time post and Dr. Dryerre was the obvious choice for the post in its new form; he held it until he retired under the age limit in 1946.

In 1923 Dr. Dryerre graduated as a Doctor of Philosophy in Edinburgh University and in 1925 was elected a Fellow of the Royal Society of Edinburgh.

When first appointed in 1919 Dr. Dryerre took over a Department in which the equipment was of a most primitive character. With characteristic energy he set to work to acquire apparatus sufficient to conduct practical classes in Biochemistry (then known as Chemical Physiology) and Biophysics (then known as Experimental Physiology), but apart from himself there was no staff. He solved the problem of technical assistance by appointing student lab. boys who usually served for one, or at the most two, terms. Though willing they could hardly be described as adept let alone expert technicians. This peculiar arrangement persisted until 1928 when the first full-time laboratory assistant was appointed, and his training had to be conducted by the part-time professor himself. In 1925 when the College buildings were finished and equipped the laboratories of the Physiology Department were provided with apparatus consistent with the importance of the subject.

As a teacher, Dr. Dryerre commanded the respect of his students. He was a lucid lecturer who had the happy knack of presenting his subject matter in a way that impressed the salient features of a lecture on his audience. Though impatient of sluggards he was always willing to help a student who had encountered difficulties in his work. In the absence of any organised medical service for veterinary students Dr. Dryerre never hesitated to put his medical knowledge at the disposal of students. At least one of them owes his life to the prompt action by Dr. Dryerre who quickly diagnosed that his collapse was due to a perforated ulcer.

During the 1939-45 war Dr. Dryerre undertook the teaching of physiology to the students in the School of Medicine of the Royal College of Surgeons and the students in the Dental School while their teachers were away on war service. The teaching of histology to these extra-mural students was provided in the Department of Anatomy in the Dick.

As a research worker Dr. Dryerre was perhaps mainly interested in the biochemical aspect of his subject. He was associated with Dr. J. Russell Greig in the early work that established the connexion between milk fever and reduction in blood calcium. He made an extensive biochemical study of the changes to be found in grass sickness of horses. Though the aetiology of this disease has not yet been solved Dr. Dryerre's meticulous work was not without merit and value.

He was intensely interested in problems arising in silver fox ranches perhaps particularly in their dietary and in problems of fertility.

He contributed papers both to the annual congress of the National Veterinary Medical Association and to quite a few of its territorial Divisions, and was elected an honorary member of the Scottish Metropolitan Division.

It may be said that the greatest contribution to veterinary science made by Dr. Dryerre was his pioneer work in establishing the fundamental importance of a knowledge of biochemistry in clinical veterinary practice, a truism appreciated by all to-day but hardly appreciated at all 40 years ago when he was first appointed to teach physiology to veterinary students. Similarly, his research work showed how biochemistry was an essential tool in the study of animal disease.

His former students remembered him with affection and respect, and frequently among themselves referred to him by his Christian name.

For some years he used to spend quite a lot of time in his caravan located on a farm in Central Perthshire. Since his retiral nearly 13 years ago he suffered several attacks of serious illness which he surmounted with indomitable courage and was able regularly to return to the Perthshire hills, which he surveyed by field glasses when no longer able to climb them.

He was twice married. His first wife died during the Second World War. His only son—Harry—a medical officer in the R.A.F., was killed in a motor accident. His son's death was a grievous blow that he bore with dignity. He is survived by his second wife.

As a teacher and research worker Dr. Dryerre will long be remembered for his contributions to the advancement of veterinary science.—ANON.

A.R.C. VETERINARY RESEARCH FELLOWSHIPS

The Agricultural Research Council is offering two Veterinary Research Fellowships to suitably qualified veterinarians. They are tenable for a maximum of 3 years, and candidates must be British subjects, hold a registrable veterinary qualification, and should have been engaged in research for not less than 3 years since qualifying.

The Council is also continuing to offer post-graduate Research Studentships to holders of veterinary qualifications, and a small number of Veterinary Training Grants to enable honours graduates in one of the basic sciences to read for a veterinary qualification. Applications for these awards should reach the Council by March 31st.

Further details of the above awards, together with information about openings in agricultural research and advisory work, are obtainable from The Secretary, Agricultural Research Council, Cunard Building, 15, Regent Street, London, S.W.1.

THE BRITISH TURKEY FEDERATION

A correspondent writes:—

The eighth British Turkey Federation Conference was held at Eastbourne from February 3rd to 5th, and it was very gratifying this year to have so many members of the veterinary profession taking an active part.

On the first day the profession was represented by Dr. D. W. B. Sainsbury who gave a very comprehensive talk on the "Optimum Environments for Turkeys" which was put over in a very clear fashion to the audience and which aroused a considerable amount of discussion.

The following day Mr. S. F. M. Davies, of the Ministry's staff at Weybridge, gave a very interesting paper on "Coccidiosis and Other Protozoa." This was extremely well received and likewise aroused some considerable questioning which Mr. Davies handled very well. The chairman for this paper was Dr. W. P. Blount.

Later on that day Dr. W. M. McKay, a member of the management committee of the British Turkey Federation, was chairman of the first part of a section dealing with "The New Look in Turkeys and How it will Affect Us." The paper was to have been given by Mr. L. Cline of California, but the author was unable to attend so his part was ably taken by Mr. Feltwell of Vitamealo, who with the help of slides gave a very thorough talk on how he saw the position in the United States. This was followed by Part II, which took the form of a panel including Dr. J. E. Wilson and Mr. J. D. Blaxland, both of the Ministry's veterinary staff, dealing essentially with poultry problems.

At the banquet on the Thursday, the toast of the British Turkey Federation was given by Col. John Baker-White and this was responded to by Dr. W. M. McKay who, in his speech, remarked on the part the veterinary profession had played in the Conference. The response to the toast of Our Guests was made by Dr. R. F. Gordon.

THE ANGELL MEMORIAL HOSPITAL

The Angell Memorial Animal Hospital of Boston, Massachusetts, announces a Residency in Pathology for the term of 12 months or more, consisting of supervised work in gross pathology and histopathology as applied to small animals. Included is an opportunity to attend lectures in pathology at Harvard Medical School and certain other lectures on pathology and related subjects in Boston.

This is a teaching hospital employing 6 graduate veterinarians as interns for fifteen-month periods. Interns are assigned in rotation to the services in the hospital, including pathology.

The Residency in Pathology is to be filled about July 1st, 1959. The exact time can be altered slightly to fit the convenience of the applicant. The minimum salary is $3,000 per annum. Additional salary might be possible, but only to a veterinarian already having advanced training in this clinical phase of pathology.

Those interested should communicate with Dr. T. C. Jones, Angell Memorial Animal Hospital, 180, Longwood Avenue, Boston 15, Massachusetts, not later than March 15th, 1959.

The chairman of Messrs. Allen & Hanburys, Mr. J. C. Hanbury, is seen addressing the press conference at which the new vaccine against *Dictyocaulus viviparus* was announced last week. On his right are the Glasgow Veterinary School research team. Reading outwards: Professor W. L. Weipers, Dr. W. F. H. Jarrett, Dr. W. I. M. McIntyre, Dr. W. Mulligan, and Mr. F. W. Jennings.

PERSONAL

Mr. D. R. Melrose has been invited by the European Association for Animal Production to attend and give a paper at the meeting of that Association which is to be held on March 25th and 26th in Paris. The

meeting will be concerned with artificial insemination of pigs, and workers on this subject from other parts of Europe have been invited. Whilst Mr. Melrose is in Paris he hopes to pay a brief visit to the National Veterinary School at Alfort and to the Animal Husbandry Research Station at Jouy-en-Josas.

Dr. V. E. Senior has been appointed Provincial Veterinarian to the Saskatchewan Department of Agriculture. He qualified in Edinburgh in 1935, and later joined the staff of the Ministry where he served until 1947. He emigrated to Canada in that year, thence to New Zealand (1953-7).

Marriage

GOULD—SCHWELLE.—On February 21st, 1959, Alan C. Gould, M.A., VET.M.B., M.R.C.V.S., Southampton, to Kiki Schwelle, Zurich.

Birth

SHRIMPTON.—On February 18th, 1959, to Rosemary, wife of Douglas F. Shrimpton, M.R.C.V.S., of 1, Lindsey Close, Bishop's Stortford, Herts., a son, Donald Mark.

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN EDINBURGH

Wednesday, April 8th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Farm Livestock Committee.
11.30 a.m. Parliamentary and Public Relations Committee.
2.15 p.m. Small Animals Committee.
5.00 p.m. Finance Sub-committee.

Thursday, April 9th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Home Appointments Committee.
11.30 a.m. Veterinary State Medicine Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, April 10th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Council Meeting.

COMING EVENTS

March

3rd (Tues.). Dance of the Ladies Guild, South East Midlands Division, V.V.B.F., at the Solarium Restaurant, Overstone, Northampton, 9.30 p.m.

4th (Wed.). Annual General Meeting of the South Wales Division at the Dolwas Restaurant and 6 Guildhall Square, Carmarthen, 2 p.m.

Annual General Meeting of the A.V.T. & R.W.'s (Northern Region) at the Veterinary Hospital, University of Liverpool, 2 p.m.

Spring Meeting of the Society of Women Veterinary Surgeons at the North of England Zoological Society Gardens, Upton-by-Chester, at 1 p.m.

5th (Thurs.). Spring Meeting of the Dumfries and Galloway Division in the Gretna Hall Hotel, Gretna, 2.15 p.m.

General Meeting of the Central Veterinary Society at the Royal Veterinary College, 6 p.m.

10th (Tues.). Annual General Meeting of the Eastern Counties Veterinary Society at the Bell Hotel, Norwich.

11th (Wed.). A meeting of the North Wales Division will be held at the Gwydir Hotel, Bettws-y-Coed at 2 p.m.

12th (Thurs.). Annual General Meeting of the Western Counties Veterinary Association at the Rougemont Hotel, Exeter, at 2 p.m.

Meeting of the Clinical Club, West of Scotland Division, at the University Veterinary School, 83, Buccleuch Street, Glasgow, C.3, at 7.30 p.m.

13th (Fri.). General Meeting of the Midland Counties Division at Regent Hotel, Leamington Spa, at 2.30 p.m.

18th (Wed.). Annual General Meeting of the Scottish Metropolitan Division in the Royal (Dick) School of Veterinary Studies, 2.45 p.m.

19th (Thurs.). General Meeting of the Society of Practising Veterinary Surgeons at the Grand Hotel, Peterborough, at 2.30 p.m.

20th, 21st and 22nd (Fri., Sat. and Sun.). Conference of the British Small Animal Veterinary Association in London.

25th (Wed.). Spring Meeting of the Lincolnshire and District Division at Eastgate Court Hotel, Lincoln, at 2.15 p.m.

April

1st (Wed.). Meeting of the R.A.V.C. Division at Glaxo Laboratories Ltd., Greenford, Middlesex, at 11 a.m.

2nd and 3rd (Thurs. and Fri.). The 21st Ordinary General Meeting of the A.V.T. and R.W's. will be held at the Gleneagles Hotel, Scotland, at 10 a.m.

8th, 9th and 10th (Wed., Thurs., and Fri.). B.V.A. Committee and Council Meetings in Edinburgh.

August

30th to 5th September. 77th Annual Congress of the British Veterinary Association in Folkestone. (Official opening Monday, August 31st.)

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Lanark. Laigh Cleuchearn Farm, East Kilbride, Glasgow (Feb. 18).

Westmorland. Park House, Ravenstonedale, Kirby Stephen (Feb. 17).

Wigtown. Low Clachmanmore Farm, Ardwell, Stranraer (Feb. 17).

Fowl Pest

Dorset. Holnest House, Holnest Park, Sherborne (Feb. 17).

Essex. Maple Cottage, Mill Lane, Pebmarsh, Halstead; Water Lane Farm, Pebmarsh, Halstead (Feb. 18); Frensham Estates Ltd., Osea Island, Maldon; Mosses Farm, Little Maplestead, Halstead (Feb. 19).

Lancs. Elgin, Bilsborrow Lane, Bilsborrow, Preston (Feb. 18).
Norfolk. Whitehouse Farm, Brockdish, Diss (Feb. 18).
Northampton. Roundhay Farm, Yardley, Hastings (Feb. 19).
Suffolk. Greenleaves, Hoxne, Diss (Feb. 17); The Hollies, Chilton, Sudbury (Feb. 18).
Warwicks. 1, Peacock Cottages, Oxhill; Back Lane Orchard, Oxhill (Feb. 19).

Swine Fever

Buckingham. Wavendon Towers, Wavendon, Bletchley (Feb. 17).
Ches. Hitchins Farm, Shocklack, Malpas (Feb. 17); Barn House Farm, Great Barrow, Chester; Heath Farm, Burton, Wirral (Feb. 18); Crewe Hall, Crewe-by-Farndon, Chester (Feb. 19).
Denbigh. Redhall Farm, Redhall Lane, Penley, Wrexham (Feb. 19).
Devon. Seale Hayne Agricultural College, Highweek, Newton Abbot (Feb. 17); Oakdene Farm, Oil Mill Lane, Clyst St. Mary, Exeter (Feb. 18).
Essex. 141, Coxtie Green Road, Pilgrims Hatch, Brentwood (Feb. 17).
Flints. Swndwr Farm, Northrop, Mold (Feb. 19).
Gloucs. Bakers Farm, Corney Wick, Cirencester (Feb. 18).
Hereford. Lower House, Preston-on-Wye (Feb. 19).
Lancs. Rock Farm, Alvanley, Warrington (Feb. 19).
Wilts. Thornend Farm, Christian Malford, Chippenham (Feb. 18).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Spread of Brucellosis within Herds—the Milk Problem

Sir,—In the brucellosis survey report (Kerr, Pearson & Rankin, 1958), it was stated that there was a number of herds infected with *Brucella abortus* without the farmer being aware of this state of affairs. Further investigations showed a considerable number of infected udders in these vaccinated herds with few or no abortions. In the course of eradication experiments further herds were discovered showing a number of cows with similar histories featured by positive blood test, positive milk test, and 80 per cent. of these milks were culturally positive. Owing to the history of adult vaccinations the interpretation of the blood test in these herds was rendered difficult.

The clinical indications, and the position of the cows in the byres, strongly suggested that infection was passing from udder to udder by the milking process. Cotton (1932) showed that Brucella organisms could penetrate the unbroken skin, and also that when it was shaved and abraded 100 per cent. infection resulted. It was clinically evident in these particular herds that the spread was facilitated in particular by the milking machine. The action of the machine may be regarded as having an abrading action on the teat. In addition Davidson and Slavin (1958) have shown that the cups carry mastitis infection from one cow to another despite dipping between cows.

At this stage it was obviously necessary to confirm that this method of spread could be experimentally produced. This was done by infecting the teats of vaccinated non-infected cows by milking with hands bathed in milk from an infected udder. This was carried out 4 times at 3-day intervals. The organism appeared in the milk of the subjected quarter in large numbers, the earliest being 2 days after the last infected milking, *i.e.* 14 days after the initial exposure. The earliest evidence of the organism in the non-infected quarters was 42 days. The blood titres of 2 cows were 1-5 to begin with and became positive in a dilution of 1:160 before the organism appeared in the untreated quarters and eventually reached 1-1,280.

The history of one of these vaccinated herds with milk-spread infection is given as an example of the difficulties of this problem. This herd has a history of complete vaccination, including cow vaccination, for some 12 years. At the initial survey of this herd in 1957 six milk reactors with udder infection were discovered. This was the first intimation to the farmer that the disease existed in his herd as no recognisable abortions had taken place. The herd was tested a year later and one of the reactors was still found to be present in the herd, regarded as being in isolation, but being milked with the same units. From this stage active steps were taken to eradicate the disease. A further 6 cows were found to be blood and milk positive, of which there were 5 culturally positive. The blood test was complicated by the persistence of vaccination titres. On short interval tests of 2 months, 8 further cows were found to be infected. Of these 14 milk-positive cows 11 were culturally positive. The latest tests on the herd are negative and the herd may now be free. In this vaccinated herd of 36 cows and in the absence of classical Brucella abortions 20 cows had been removed as udder infected. It was obvious from our experience of this and other herds that it is not sufficient to isolate infected cows at, near, or about the time of calving. Udder-infected cows must be found early and removed for slaughter; if retained they must be kept in an isolation which not only separates the cow from healthy stock but also excludes milk and the process of milking. The spread from udder to udder is insidious, and is dangerous in that neither the farmer nor the veterinary surgeon can recognise the infected udder without recourse to milk agglutination tests and culture. Consideration must also be given to the contamination of food and pasture by infected milk.

The lymph glands, udder, and uterus from field-infected cows in the eradication experiment are subjected to cultural examination. It is significant that at this stage of the experiment 80 per cent. are infected in the udder and its associated lymph glands.

In only 10 per cent. of the cows at *post mortem* has the organism in addition been cultivated from the uterus and the adjacent iliac glands. The organ-

ism has not yet been isolated from the spleen or any other lymph nodes in these chronically infected non-aborting cows. The presence of Brucella organisms in the udder of vaccinated cows may be related to the complex position of that organ to the systemic system (Kerr, Pearson, & Rankin, "The Bovine udder and its agglutinins," in press).

Yours faithfully,
W. R. KERR,
J. E. F. RANKIN.

Veterinary Research Division,
Ministry of Agriculture,
Stormont,
Belfast.
February 12th, 1959.

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DAVIDSON, I., & SLAVIN, G. (1958). *Vet. Rec.* **70**. No. 44.
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A Treatment for Certain Ear Conditions

Sir,—I read Mr. W. J. Jordan's letter of February 14th with interest. His observations on the use in otitis of the product he describes can be closely paralleled by those made in this practice when using a compound specifically formulated to soften discharges and wax and soothe the irritated meatus thus facilitating cleansing.

The product* we now use as routine in all cases of otitis in small animals, except the acutely ulcerated and moist types, has the advantages he describes with, in addition, the cleansing and antiseptic properties of Cetrimide, and the bacteriostatic qualities of sulphacetamide.

In parasitic otitis and the apparently non-specific cases of wax accumulation we seldom find any treatment necessary other than the daily instillation of a few drops into affected ears.

We have not yet been so unfortunate as to find any animals resenting the medication.

Yours faithfully,
P. K. HALL-PATCH.

Highlands,
Dibden Purlieu,
Southampton.
February 14th, 1959.

* Clendrol: manufactured by J. M. Loveridge Ltd., Southampton.

Calcium Lactate as a Dietary Supplement for Laying Hens

Sir,—Reports from the field indicated that the addition of from 1 to 2 per cent. of calcium lactate to layers' mash had resulted in an increased egg-production by laying hens. A small-scale trial, using 36 Brown Leghorn X Light Sussex pullets, initially at point of lay, was therefore undertaken.

The birds were divided randomly into 3 groups each of 12. Control group (I) was fed a basal mash comprising: white fish-meal, 7.5; weatings, 40.0; yellow maize-meal, 10; ground oats, 16.0; grass-meal, 2.5; ground barley, 15.0; groundnut meal, 6.0; calcium carbonate, 1.91; dicalcium phosphate, 0.5; sodium chloride, 0.5; and a trace element mixture, 0.09 per cent. For each ton of ration, 4,000,000 I.U. of vitamin A, 1,000,000 I.U. of vitamin D_3, and 2 g. of riboflavin were incorporated.

Experimental groups (II) and (III) had calcium lactate pentahydrate (containing 70 per cent. calcium lactate) incorporated in their diets at levels of 1 and 2 per cent. respectively, in each case by substitution for an equivalent weight of calcium carbonate in the basal mash. Replacement was not therefore on a calcium-for-calcium basis, and the found calcium levels of the 3 diets were: (I) 1.83 per cent.; (II) 1.5 per cent.; and (III) 1.32 per cent., respectively. In the case of diets (II) and (III), therefore, the levels are somewhat lower than those usually fed in commercial practice.

The birds were housed in individual laying batteries and their daily food consumption was recorded. each egg was marked, weighed, and candled before being sent to the packing station. There was no significant variation in egg-weight or egg-quality between the produce of the 3 groups. Culling was not attempted in view of the numbers of birds involved.

Over the first 8 months of the experiment, at the end of which time a proportion of the birds in all groups had started to moult, the group egg-production records were: (I) 1,443, (II) 1,736, and (III) 1,696, respectively, equivalent to 40 per cent., 60.4 per cent., and 59.7 per cent. production. From the formulae of Fisher (1954), the resulting values for t were 4.992 for the 1 per cent. group and 4.416 for the 2 per cent. group, the probability being <0.1 per cent. in each case. These p values are taken from the tables of Fisher and Yates (1957) at a level requiring 14 degrees of freedom, *i.e.* in direct relationship to the number of birds under examination.

A careful check was kept on the amount of food consumed by the individual groups. Over the experimental period, the consumption varied considerably, and always the amount eaten by the treated birds was less than that eaten by the controls. The total amount of food consumed by each group for the 8-month period was (I) 738 kg., (II) 528 kg., and (III) 605 kg. respectively. Values of t were found to be 3.690 and 2.441 for 1 and 2 per cent. experimental groups and probability <1 and <5 per cent. respectively.

There was, therefore, a significant increase in egg-production, accompanied by a significant decrease in food-consumption and, as a result of this promising result, further and more extensive trials have been inaugurated. The first such trial, which has now run for 6 months, shows a percentage lay for a group receiving 1 per cent. calcium lactate of 10.7 per cent. above that of the control hens.

We also have confirmation from 3 independent sources of the beneficial effects of calcium lactate pentahydrate upon egg-production, the increased laying percentages ranging up to 15 per cent. These other workers have also noted a decrease in food consumption, although not always of the same order

as that reported here. A detailed report will shortly be prepared for publication elsewhere. We are grateful to Messrs. Bowmans Chemicals Limited of Widnes for supplies of the lactate used .

Yours faithfully,

ALASTAIR N. WORDEN,
T. F. REID.

Nutritional Research Unit,
Huntingdon.
February 20th, 1959.

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Eclipse and Sainbel

Sir,—The usual account of the *post-mortem* examination of the celebrated race-horse Eclipse is that this was performed by Sainbel in February, 1789, shortly after he came to this country for the second time, and that Bracy Clark, later one of Sainbel's first students at the London Veterinary College, was one of those present at the autopsy.

I have put together from various sources a slightly different version of this event which I believe to be correct.

The *post-mortem* examination was carried out by Edward Bond, who 5 years later was the first veterinary student to pass out of the London College. Bond, when qualified, practised from the Haunch of Venison Yard, Upper Brook Street, London, and held the appointment of veterinary surgeon to the Duke of Clarence.

Sainbel's part in the affair appears to be that he directed the dissection of the carcase which proceeded until only the bones with the ligaments attached were left.

It was Henry Clark, Bracy's elder brother, who was one of the spectators, and Sainbel gave him a note on the arrangement of the bones. Henry Clark was an ardent sportsman and took a great interest in equine matters, and for that reason he had driven over to Canons, in Middlesex, to attend the dissection. It is recorded that Henry Clark pointed out to his brother Bracy the opportunities afforded by veterinary practice and was responsible in this way for the latter forsaking his medical career.

The owner of Eclipse, during his years of fame, was Colonel Dennis O'Kelly. O'Kelly died in December, 1787, just over a year before the death of Eclipse. He had left his Canons estate to his widow for life, and his stallions, Eclipse and Dungannon, to his brother Philip. These two horses were not to be sold but to be kept for breeding. Dennis O'Kelly was apparently a colourful character and was the owner of another famous animal—a parrot. This bird was born in Bristol and was believed to be the first bred in this country. The parrot had a most extensive repertoire and among other accomplishments was accustomed to whistle all thirty-five verses of the 104th Psalm.

A few years after the dissection, Philip O'Kelly gave the skeleton to Bond who had it in his museum in Upper Brook Street until his death. Bracy Clark had lent £500 to Bond and as his widow was not able to discharge this debt she gave Clark the skeleton.

Eclipse remained in Clark's study until shortly before his death in 1860. Clark had been offered 60 guineas for the skeleton by the Royal College of Surgeons but had refused this offer—"a hundred being the price fixed for this king among horses." John Gamgee of the New Veterinary College, Edinburgh, gave Clark 100 guineas and took Eclipse up to Edinburgh.

In 1871, Gamgee presented the skeleton to the museum of the Royal College of Veterinary Surgeons and there it remained, in Red Lion Square, until 1921. When that museum was closed it was presented to the Natural History Museum in South Kensington, where it is to this day.

Yours faithfully,

J. W. BARBER-LOMAX.

Roughwood House,
Chorleywood,
Herts.
February 20th, 1959.

New Vaccine—Press Conference

Sir,—Might it not be that it is the Veterinary Therapeutic Testing Board which needs the Professional Secretary?

Yours faithfully,

A. W. HART.

12a, South Street,
Dorchester,
Dorset.
February 23rd, 1959.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 31st Jan., 1959		4	—	—	47	—	29
Corresponding period in	1958	8	—	28	45	—	58
	1957	17	—	1	67	—	40
	1956	100	—	—	24	—	28
1st to 31st January 1959		12	—	—	80	—	84
Corresponding period in	1958	15	—	43	120	—	106
	1957	32	—	10	125	—	70
	1956	117	—	—	97	—	58